



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/790,165

03/01/2004

Dieter Husar

DT-6772

9992

30377 7590 03/21/2008

DAVID TOREN, ESQ.  
ABELMAN FRAYNE & SCHWAB  
666 THIRD AVENUE  
NEW YORK, NY 10017-5621

EXAMINER

GORDON, BRIAN R

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

03/21/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/790,165	<b>Applicant(s)</b> HUSAR ET AL.	
	<b>Examiner</b> Brian R. Gordon	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 3-1-04.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-8,31-37,41 and 42 is/are allowed.
- 6) ☒ Claim(s) 9-30 and 38-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 9-30 and 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by van Lintel, US 5,224,843.

van Lintel discloses a micropump system. Pumping takes place within the micropump as a result of the deformation of a plate (12) using a piezo-electric pad (13) (actuator module). The deformation produces a variation in volume within a pumping chamber (15) defined inside a plate (11) which is made of a material which can be machined using photolithographic processes.

An object of the invention to provide a micropump having a first wafer of a material capable of being machined using photolithographic technology in such a way as to define with at least one second support wafer bonded face to face with the first wafer a pump chamber, a first valve of the check-valve (mechanical closure) type through which said pump chamber is able to communicate selectively with one pump inlet and a second valve of the membrane type through which said pump chamber can communicate selectively with one outlet of the pump, means being provided to cause a periodic variation in the volume of said pump chamber, characterized in that said outlet communicates directly with an isolated volume of said pump chamber by means of said

second valve and situated on the same side of this valve as the channel through which this valve communicates with the pump chamber in such a way that both the pressures prevailing in this pump chamber and this volume act in the direction of opening on said second valve and in that said second valve is in open communications with said first valve via said pump chamber in such a way that, during the outlet phase of the pump, this chamber communicates directly with said outlet through said second valve in the open position.

The micropump of FIGS. 1 and 2 has a base wafer 1 of, for example, glass, which is pierced by two channels 2 and 3 forming the inlet channel and the outlet channel of the pump respectively. These channels 2 and 3 communicate with connectors 4 and 5 respectively.

The connector 4 is connected to a tube 6 which in turn is connected to a reservoir 7 containing the liquid to be pumped. The reservoir is closed by a pierced cap, a movable piston isolating the working volume of the reservoir 7 from the outside. This reservoir can, for example, contain a medicament if the pump is used to inject a precise dose of this medicament into the human body. In this application the micropump can be worn on the body of the patient or implanted therein.

The outlet connector 5 may be connected to an injection needle (open jet propotioner) (not shown) joined thereto by a tube 10.

A wafer 11 of silicon or other material capable of being machined using photolithographic etching technology is bonded to the glass wafer 1. Above this silicon wafer is a glass closure wafer 12, the thickness of which is such that it can be deformed

by a control element 13 which, in the application of the invention described herein, is a piezoelectric disc provided with electrodes 13a and 13b connected to an alternative voltage generator 14.

The wafers 11 and 12 together define first of all a pumping chamber 15 (see also FIG. 2) for example circular in shape, this chamber being situated below an area of the wafer 12 which can be flexed by the control element 13.

A first valve 16 of the check-valve type machined out of the silicon wafer 11 is interposed between the inlet channel 2 and the pump chamber 15. This valve is located under the pump chamber and comprises a membrane 16a substantially circular in shape and pierced in its centre by an opening 16b which is square in the embodiment shown. On the side of the channel 2, the valve 16 has an annular rib 16c which is substantially triangular in section. This rib 16c surrounds the opening 16b and is covered by a fine oxide layer 17 also obtained using photolithographic technology. This oxide layer induces an extra thickness which subjects the membrane 16a to a certain degree of bias or pretension when the top of the rib 16c bears against the glass wafer 1, the latter thus acting as seat for the valve 16.

When no electric voltage (power supply/control means) is applied to the piezoelectric disc 13, the inlet valves 16 and outlet valves 18 are in the closed position. When an electric voltage is applied, the piezoelectric disc 13 flexes, causing the wafer 12 (diaphragm) to bend towards the inside. The pressure in the pump chamber 15 therefore rises, actuating the opening of the outlet valve 18 as soon as the force acting on the membrane (diaphragm) as a result of the pressure in the chamber 15 is greater

than the difference between the force created by the pretension of the valve 18, ensured by the layer of silicon oxide 17 and the force resulting from the pressure in the outlet channel 3. The fluid contained in the pump chamber is thus driven towards the outlet channel 3 by displacement of the flexible zone of the wafer 12. During this phase, the inlet valve 16 is kept closed by the pressure prevailing in the pump chamber 15. The fluid runs without encountering noteworthy resistance so that the pump chamber 15 then communicates directly with the outlet channel 3.

In contrast, when the electrical voltage is cancelled, the piezoelectric disc 13 resumes its initial shape or is flexed in the other direction so that the pressure in the pump chamber 15 falls. This causes the outlet valve 18 to close as soon as the force induced by the pressure in the pump chamber 15 is lower than the difference between the force created by the pretension of the valve and the force due to the pressure in the outlet channel 3. The inlet valve 16 opens as soon as the sum of the force due to the pressure in the pump chamber and of the force created by the pretension of the valve 16 is lower than the force due to the pressure in the inlet channel 2. There is then aspiration of the fluid in the pump chamber 15 via the inlet channel 2 as a result of displacement of the flexible zone of the wafer 12.

***Allowable Subject Matter***

3. Claims 1-8, 31-37, and 41-42 are allowed.

The prior art of record does not disclose nor fairly suggest that the device comprises the proportioning control, the display, or that the operating means is accommodated on a joint printed circuit board, that the power supply is accommodated

at the head region of the actuator module, a displacement means that has a screw including a servo-drive and a screw nut and sensors mounted on the screw. The prior art of record also does not disclose that the device comprises a cooling means and/or heat insulation for liquid in the reservoir, or a heating means for the liquid in the micro-diaphragm pump, the open-jet proportioner, and/or the connecting lines, means connected to a sensor for detection of a meniscus of the liquid at the beginning of a displacement length of the liquid for adjustment of an initial position for displacement of a liquid column, a proportioning control means that determines the volume being proportioned on basis of a calibration of the stroke volume that it establishes by displacing an auxiliary liquid column by the micro-diaphragm pump along with a calibration length between two sensors operatively connected with the proportion control means for detection of a meniscus of an auxiliary liquid column, and reservoir with a capillary balance system.

### ***Conclusion***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. van Lintel (,556; ,014; ,562; ,724), Zengerle et al. (,889; ,465; and WO 98/36832), Richter, Ross et al., Weinberg, Wojcicki et al, and Greisch et al. disclose liquid transfer devices.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian R. Gordon whose telephone number is 571-272-1258. The examiner can normally be reached on M-F, 1st Fri. Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on 571-272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Brian R Gordon/  
Primary Examiner  
Art Unit 1797